

REMARKS

Claims 1, 6-10, 12, 16-19, 22, 26-29, and 31-41 are pending. Claims 1, 6-10, 12, 16-19, 22, and 26-29 have been amended. New claims 31-41 have been added. Claims 2, 11, 13, 14, 20, 21, 25, and 30 have been cancelled. No new matter has been introduced. Reexamination and reconsideration of the application are respectfully requested.

In the January 29, 2004 Office Action, the Examiner objected to the drawings under 37 CFR 1.83 (a). Applicants have enclosed a redlined version of FIG. 2B and FIG. 2C, and provided a replacement FIG. 2B and FIG. 2C. The Specification has been amended to be consistent with FIG. 2B and FIG. 2C. The Examiner objected to the Specification for failing to provide proper antecedent basis for the claimed subject matter. Claim 10 has been amended to be consistent with the specification.

The Examiner rejected claims 20 and 21 under 35 U.S.C. §112, first paragraph. Claims 20 and 21 have been cancelled. The Examiner rejected claims 1, 2, 6-13, 16-22, and 26-30 under 35 U.S.C. §112, second paragraph, as being indefinite. Applicants have cancelled claims 2, 11, 13, 20-21, and 30, and amended claims 1, 6-10, 12, 16-19, 22, and 26-29. The Examiner rejected claim 11 under 35 U.S.C. §101. Applicants have cancelled claim 11. The Examiner rejected claims 1, 2, 6-8, 10-13, 16-18, 20-22, and 26-30 under 35 U.S.C. §102(e) as being anticipated by Huemoeller, U.S. Patent No. 6,448,509 B1 (hereinafter the Huemoeller reference). Claims 2, 11, 13, 20, 21, and 30 have been cancelled. This rejection is respectfully traversed with respect to the pending claims.

Independent claim 1, as amended, recites:

A method for dissipating heat from a localized area within a semiconductor die, the method comprising:

providing a semiconductor die constructed and arranged to include at least one conduit portion, at least a portion of the conduit portion being proximate to the localized area, the conduit portion being at least partially filled with a heat-dissipating material;

absorbing, by the conduit portion, heat from the localized area; and

dissipating, by the conduit portion, at least a portion of the heat away from the localized area.

The Examiner rejected claims 1, 2, 6-8, 10-13, 16-18, 20-22, and 26-30 under 35 U.S.C. §102(e) as being anticipated by the Huemoeller reference.

The Huemoeller reference does not disclose, teach, or suggest the method specified in independent claim 1, as amended. Unlike the method specified in independent claim 1, as amended, the Huemoeller reference does not show **"providing a semiconductor die constructed and arranged to include at least one conduit portion, at least a portion of the conduit portion being proximate to the localized area, the conduit portion being at least partially filled with a heat-dissipating material"**.

The Applicants respectfully submit that the Huemoeller reference does not teach the invention as specified in independent claim 1, as amended. The Huemoeller reference states "one method by which the **exemplary PCB 10** may be made is illustrated sequentially in FIGS. 4-7. The method begins with the provision of a relatively thick first sheet, or layer 12, of a metal to serve as the heat spreader of the PCB. In one embodiment, the layer 12 comprises a 0.25 mm (0.010 in.) thick sheet of pure copper. A plurality of clearance openings 14 is formed in the layer 12 at locations corresponding to the desired locations of "clearance vias," i.e., locations in the **finished PCB** at which it is desired to conduct an electrical signal from the

upper surface 16 of the PCB to its lower surface 18. The clearance openings 14 can be formed by drilling, punching, or printing and etching the metal layer 12 from one or both sides thereof, as in conventional PCB fabrication." (Column 3, lines 20-33).

The Huemoeller reference also states "the remaining apertures 34 are formed at locations other than those of the clearance openings 14, such that the thermal spreader, i.e., the central layer 12 of metal, is integrally connected to the metal paths through the apertures. These latter apertures 34 thus function as "thermal vias" 40, i.e., locations in the **finished PCB** where it is desired to conduct heat from the upper layer 28 of metal to the central layer 12. The central layer 12 then spreads the heat throughout the length and breadth of the **PCB 10**, and thence, to the lower layer 22 of metal, where it can be conducted by, e.g., a solder ball 110, into a heat-sinking "main board" (not illustrated) to which the package 100 is mounted. In FIG. 7, the thermal via 40 is shown formed **immediately below the die 102 for the direct conduction of heat from the bottom of the die** into the heat spreading central layer 12." (Column 4, lines 28-43).

The Huemoeller reference describes the manufacture of a printed circuit board (PCB) but does not describe "**a semiconductor die constructed and arranged to include at least one conduit portion, at least a portion of the conduit portion being proximate to the localized area, the conduit portion being at least partially filled with a heat-dissipating material**".

Accordingly, Applicants respectfully submit that independent claim 1, as amended, distinguishes over the above-cited reference. Claims 6-10 depend directly or indirectly from independent claim 1, as amended. Therefore, Applicants respectfully submit that claims 6-10 distinguish over the above-cited reference for the same reasons as set forth above with respect to independent claim 1, as

amended.

Independent claim 12, as amended, recites limitations similar to independent claim 1, as amended. Specifically, independent claim 12, as amended, recites “a semiconductor die comprising at least one conduit portion, at least a portion of the conduit portion being proximate to a localized area; and a heat-dissipating material at least partially filling the conduit portion”.

Accordingly, Applicants respectfully submit that independent claim 12, as amended, distinguishes over the above-cited reference for the same reasons as set forth above with respect to independent claim 1, as amended. Claims 16-19, 22, and 26-30 depend directly, or indirectly, from amended independent claim 12. Therefore, Applicants respectfully submit that claims 16-19, 22, and 26-30 distinguish over the above-cited reference for the same reasons as set forth above with respect to independent claim 12, as amended.

Applicants have added new claims 31-41 to further define the invention. Claims 31-41 recite limitations similar to independent claim 1, as amended. Independent claim 31 recites “a semiconductor die comprising; a microprocessor circuit; at least one conduit, a first portion of the conduit being proximate to the microprocessor circuit, and a second portion of the conduit having an end portion at a face of the die; and a heat-dissipating material at least partially filling the conduit, wherein the conduit is constructed and arranged to absorb heat from the microprocessor circuit and to dissipate at least a portion of the heat away from the microprocessor circuit.”

The Huemoeller reference does teach removing heat from a microprocessor circuit internal to a semiconductor die using a conduit internal to the die and proximate to the microprocessor circuit. Dependent claim 41 further distinguishes over the reference by specifying removing heat from a floating point unit in the microprocessor

circuit internal to a semiconductor die using a conduit internal to the die and proximate to the floating point unit.

Accordingly, Applicants respectfully submit that new claims 31-41 distinguish over the above-cited reference.

Applicants believe that the foregoing amendment and remarks place the application in condition for allowance, and a favorable action is respectfully requested.

If for any reason the Examiner finds the application other than in condition for allowance, the Examiner is requested to call the undersigned attorney at the Los Angeles telephone number (213) 488-7100 to discuss the steps necessary for placing the application in condition for allowance should the examiner believe that such a telephone conference would advance prosecution of the application.

Respectfully submitted,

PILLSBURY WINTHROP LLP

Date: April 26, 2004

By: 

Roger R. Wise
Registration No. 31,204
Attorney for Applicant(s)

725 South Figueroa Street, Suite 2800
Los Angeles, CA 90017-5406
Telephone: (213) 488-7100
Facsimile: (213) 629-1033